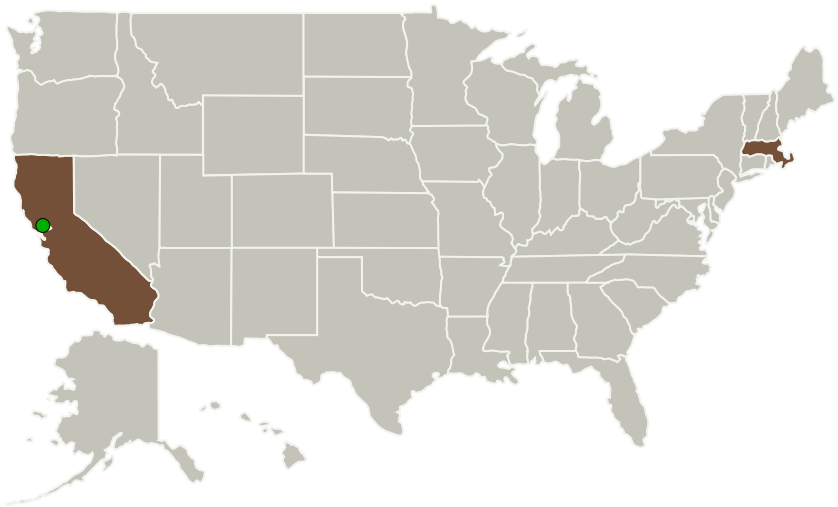
Fast Neutron Dosimeter for the Space Environment, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

Secondary neutrons make a significant contribution to the total absorbed dose received by space crews during long duration space missions However, only a limited number of measurements of the dose contribution from secondary neutrons have been made. In part this is due to an inability to easily discriminate between the fraction of dose which results from secondary neutrons and that which results from exposure to energetic charged particles. The energy of the secondary neutrons range from 1 to >100 MeV. Scintillation materials provide the optimum volume to payload performance, but their use has been limited by the need for PMTs. A compact, lightweight, low-voltage, sensitive photodetector, such as CMOS SSPMs are an ideal candidate for this application. In this work, we propose to develop a compact, lightweight, energy-efficient dosimeter for secondary neutrons from space radiation using state-of-the-art scintillation materials with a charged particle shield coupled to a high-gain, solid-state photomultiplier (SSPM), which is a high-density array of Geiger photodiodes, fabricated with CMOS (complementary metal-oxide-semiconductor) technology. Such a dosimeter would overcome many of the limitations in the current generation of neutron dosimeters and meet the dosimetry needs for future human-space-exploration missions to the moon and Mars.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Radiation Monitoring Devices, Inc.	Lead Organization	Industry	Watertown, Massachusetts
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140075)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Radiation Monitoring Devices, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

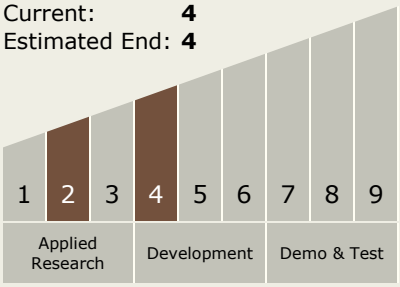
Carlos Torrez

Principal Investigator:

James Christian

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.5 Radiation
    - TX06.5.5 Monitoring Technology

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System